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SECURE GATEWAY MULTIPLE AUTOMATED DATA STORAGE SYSTEM SHARING

BACKGROUND OF THE INVENTION

1. Technical Field:

The present invention relates generally to electronic media storage and retrieval and in particular to an improved method and apparatus for automating the movement of data storage units from one automated data storage system to another.

2. Description of Related Art:

Storage library systems are capable of storing and rapidly retrieving large quantities of information stored in storage media cartridges. Such storage library systems often use robotic mechanisms to improve the speed of information retrieval and reliability of maintaining the storage library cartridge inventory.

An automatic cartridge library is a system used for handling large amounts of information in a data processing system. These types of systems store and manage large numbers of standardized cassettes containing magnetic tape on which data is recorded. Typically, an automated cartridge library is comprised of arrays of uniquely identified cells in which each cell contains a single tape cartridge. These cells are arranged in

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arrays or racks for holding many of these cartridges. Each cartridge has identifying information, such as, for example, a bar code. A robotic arm, having an optical system for selecting the correct cartridge, is operable within the automated cartridge library to locate a particular cell, retrieve a tape cartridge from the cell, convey the tape cartridge to a tape drive, and insert the tape cartridge into a tape drive.

For years now magnetic tape cartridges have proven to be an efficient and effective medium for data storage, including backing up data from primary storage devices and acting as primary storage devices for infrequently accessed data. A tape cartridge is a housing containing magnetic tape. The tape cartridge, which is also referred to as a "tape", may be wound onto one or more reels within the housing.

Large computer systems have a need to access numerous cartridges. To this end, automated cartridge handling systems or libraries for cartridges have been developed for making the cartridges automatically available to the computer. Many of these automated libraries resemble jukeboxes. These automated libraries are also referred to as "automated cartridge systems" and may contain thousands of cartridges within a single automated cartridge system. The cartridges within an automated cartridge system are accessed using automated or robotic systems. In some systems, a robotic arm moves

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around within a housing containing cartridges stored in array holders or slots and moves the cartridges. The robotic arm is used to move a cartridge from the array to a tape drive. The robotic arm also is used to remove a cartridge from a tape drive and place the cartridge back into the array. These automated libraries also include automated mechanisms to introduce and remove tape cartridges from the library.

Automated data storage library systems provide a means for large quantities of information to be efficiently stored and retrieved by external systems. These systems generally include one or more robotic units that move data storage media to and from read/write devices where the information can be accessed. In order to control these movements, the precise location of the robotic mechanisms within the library relative to the data storage media and the read/write devices must be known. An example of such a system is a tape library. In this case, tape cartridges are stored in specific locations within a structure, and a robotic unit moves about the structure, transferring cartridges to and from tape drives where the information can be accessed by an external host.

Many of these automated cartridge systems are accessed through a network. The network client protocols for these automated cartridge systems are often proprietary and are not easy to develop, port, maintain,

and extend. Currently, access to an automated cartridge system from a client location requires installation of software encompassing the proprietary protocol. Porting the protocols to different platforms to control these automated cartridge systems is difficult, especially in view of the many different types of platforms that have to be supported for different customers.

In many applications, the amount of data is large enough that multiple library storage modules are employed in which each module contains cell arrays and a robotic arm, but does not require additional host computers and does not contain a tape drive. These multiple library storage units are typically arranged adjacent to one another and pass-through ports are provided for passing tape cartridges from one library storage module to an adjacent library storage module. In these systems, a problem exists in automated library systems to facilitate loading and unloading of cartridges when the number of cartridges and drive devices are greater than some threshold of reasonable performance.

Within certain intelligence communities, there exist a number of separate networks carrying, for example, unclassified, secret and top secret data. The rules governing network security may be typically set by a government security agency, such as, for example, the National Security Agency (NSA) who, without exception may not allow any of the three networks to communicate with

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each other over known communication paths, such as, via electronic, fibre, firewalls and the like. The method data is transmitted presently is that a user creates two data cartridges, one of the data cartridges remains in its current environment and the second data cartridge may be hand carried to the next security level where it is catalogued into the security system and never returned to its origination point. Consequently, any data passing from one security level to the next higher security level is manual, which is inherently slow and costly considering the secure environments. In addition, any time a data cartridge is created and passed up to the next level of security, the site at which the cartridge is delivered ensures that the data cartridge is never inadvertently or otherwise returned to a lower security level. The logistics involved with manual handling and transportation of secure date is staggering.

In addition, a user faced with greater than sixteen library storage modules (LSMs) requires even more manual intervention. Presently, within some organizational frameworks, anyone wishing to share cartridges in multiple LSMs within an automated cartridge system (ACS) must have a shared control data set (CDS) in Automated Cartridge System Library Server(ACSLS) or a third party catalogue. Since a shared server may be required to connect to an unclassified and classified network,

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security personnel within security agencies may not authorize the server connection. Although firewalls may be installed in a local area network (LAN) connection, the security personnel still may not authorize the connection between the two networks. Even if there was the remotest possibility that the system could be compromised by allowing secret or top secret data to be transferred back to the unclassified system, security personnel would not authorize the connection between the unclassified and classified networks.

Therefore, any sharing of data must be accomplished without sharing the ACSLS or any type of LAN/WAN connections between the LSM. Additionally, if allowed, any such connections must only allow data to flow to a higher security level but not allow data to flow to a lower security level.

Therefore, it would be advantageous to have an improved method and apparatus for addressing security issues of transmission of data between an unclassified and classified network. It would also be advantageous to have an improved method and apparatus for allowing the expansion beyond sixteen library storage modules without major revisions to the host software component (HSC).

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SUMMARY OF THE INVENTION

The present invention provides secure gateway multiple automated data storage system sharing. Data is transmitted from a first data storage unit within a first automated data storage system to a second data storage unit. A request is then received from a second data storage system for the second data storage unit. The second data storage unit is then transported to the second data storage system.

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BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

Figure 1 depicts a pictorial representation of a distributed data processing system is in which the present invention may be implemented;

Figure 2 depicts a block diagram of a data processing system which may be implemented as a server, in accordance with the present invention;

Figure 3 depicts a block diagram of a data processing system in which the present invention may be implemented;

Figure 4 is a block diagram illustrating data flow paths used to transfer data between a primary storage system and a secondary storage system in accordance with a preferred embodiment of the present invention;

Figure 5 is a block diagram of a mass storage system which operates with shared catalogues in accordance with a preferred embodiment of the present invention;

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Figure 6 is a block diagram of a mass storage system which operates with separate catalogues in accordance with a preferred embodiment of the present invention;

Figure 7 is an exemplary flowchart illustrating a gateway pass through port (GPTP) in accordance with a preferred embodiment of the present invention;

Figure 8 is an exemplary flowchart illustrating a source automatic cartridge system in accordance with a preferred embodiment of the present invention; and

Figure 9 is an exemplary flowchart illustrating a destination automatic cartridge system in accordance with a preferred embodiment of the present invention.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference now to the figures, and in particular with reference to **Figure 1**, a pictorial representation of a distributed data processing system is depicted in which the present invention may be implemented.

Distributed data processing system **100** is a network of computers in which the present invention may be implemented. Distributed data processing system **100** contains network **102**, which is the medium used to provide communications links between various devices and computers connected within distributed data processing system **100**. Network **102** may include permanent connections, such as wire or fiber optic cables, or temporary connections made through telephone connections. In the depicted example, server **104** is connected to network **102**, along with storage unit **106**. In addition, clients **108**, **110** and **112** are also connected to network **102**. These clients, **108**, **110** and **112**, may be, for example, personal computers or network computers.

For purposes of this application, a network computer is any computer coupled to a network that receives a program or other application from another computer coupled to the network. In the depicted example, server **104** provides data, such as boot files, operating system images, data from databases or specific files used by

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applications, and executable modules of applications, to clients **108-112**. Clients **108**, **110** and **112** are clients to server **104**. Distributed data processing system **100** may include additional servers, clients, and other devices not shown. Distributed data processing system **100** also includes printers **114**, **116** and **118**. A client, such as client **110**, may print directly to printer **114**. Clients such as client **108** and client **112** do not have directly attached printers. These clients may print to printer **116**, which is attached to server **104**, or to printer **118**, which is a network printer that does not require connection to a computer for printing documents. Client **110**, alternatively, may print to printer **116** or printer **118**, depending on the printer type and the document requirements.

In the depicted example, distributed data processing system **100** is the Internet, with network **102** representing a worldwide collection of networks and gateways that use the TCP/IP suite of protocols to communicate with one another. At the heart of the Internet is a backbone of high-speed data communication lines between major nodes or host computers consisting of thousands of commercial, government, education, and other computer systems that route data and messages. Of course, distributed data processing system **100** also may be implemented as a number of different types of networks such as, for example, an intranet or a local area network. **Figure 1** is intended

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as an example and not as an architectural limitation for the processes of the present invention.

Referring to **Figure 2**, a block diagram of a data processing system which may be implemented as a server, such as server **104** in **Figure 1**, is depicted in accordance with the present invention. Data processing system **200** may be a symmetric multiprocessor (SMP) system including a plurality of processors **202** and **204** connected to system bus **206**. Alternatively, a single processor system may be employed. Also connected to system bus **206** is memory controller/cache **208**, which provides an interface to local memory **209**. I/O bus bridge **210** is connected to system bus **206** and provides an interface to I/O bus **212**. Memory controller/cache **208** and I/O bus bridge **210** may be integrated as depicted.

Peripheral component interconnect (PCI) bus bridge **214** connected to I/O bus **212** provides an interface to PCI local bus **216**. A number of modems **218-220** may be connected to PCI bus **216**. Typical PCI bus implementations will support a specific number (often in the range of two to seven) of PCI expansion slots or add-in connectors. Communications links to network computers **108-112** in **Figure 1** may be provided through modem **218** and network adapter **220** connected to PCI local bus **216** through add-in boards.

Additional PCI bus bridges **222** and **224** provide interfaces for additional PCI buses **226** and **228**, from

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which additional modems or network adapters may be supported. In this manner, server **200** allows connections to multiple network computers. A memory mapped graphics adapter **230** and hard disk **232** may also be connected to I/O bus **212** as depicted, either directly or indirectly. Those of ordinary skill in the art will appreciate that the hardware depicted in **Figure 2** may vary. For example, other peripheral devices, such as optical disk drives and the like, also may be used in addition to or in place of the hardware depicted. The depicted example is not meant to imply architectural limitations with respect to the present invention.

The data processing system depicted in **Figure 2** may be, for example, an IBM RS/6000, a product of International Business Machines Corporation in Armonk, New York, running the Advanced Interactive Executive (AIX) operating system.

With reference now to **Figure 3**, a block diagram of a data processing system in which the present invention may be implemented is illustrated. Data processing system **300** is an example of a client computer. Data processing system **300** employs a peripheral component interconnect (PCI) local bus architecture. Although the depicted example employs a PCI bus, other bus architectures, such as Micro Channel and ISA, may be used. Processor **302** and main memory **304** are connected to PCI local bus **306** through PCI bridge **308**. PCI bridge **308** may also include

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an integrated memory controller and cache memory for processor **302**.

Additional connections to PCI local bus **306** may be made through direct component interconnection or through add-in boards. In the depicted example, local area network (LAN) adapter **310**, SCSI host bus adapter **312**, and expansion bus interface **314** are connected to PCI local bus **306** by direct component connection. In contrast, audio adapter **316**, graphics adapter **318**, and audio/video adapter (A/V) **319** are connected to PCI local bus **306** by add-in boards inserted into expansion slots. Expansion bus interface **314** provides a connection for a keyboard and mouse adapter **320**, modem **322**, and additional memory **324**. In the depicted example, SCSI host bus adapter **312** provides a connection for hard disk drive **326**, tape drive **328**, CD-ROM drive **330**, and digital video disc read only memory drive (DVD-ROM) **332**. Typical PCI local bus implementations will support three or four PCI expansion slots or add-in connectors.

An operating system runs on processor **302** and is used to coordinate and provide control of various components within data processing system **300** in **Figure 3**. The operating system may be a commercially available operating system, such as AIX, which is available from International Business Machines Corporation. "AIX" is a trademark of International Business Machines Corporation. An object oriented programming system, such as Java, may

run in conjunction with the operating system, providing calls to the operating system from Java programs or applications executing on data processing system **300**. Instructions for the operating system, the object-oriented operating system, and applications or programs are located on a storage device, such as hard disk drive **326**, and may be loaded into main memory **304** for execution by processor **302**.

Those of ordinary skill in the art will appreciate that the hardware in **Figure 3** may vary depending on the implementation. For example, other peripheral devices, such as optical disk drives and the like, may be used in addition to or in place of the hardware depicted in **Figure 3**. The depicted example is not meant to imply architectural limitations with respect to the present invention. For example, the processes of the present invention may be applied to multiprocessor data processing systems.

The present invention provides a secure data storage unit gateway system. In the following figures a tape cartridge data storage unit is described using a automated tape cartridge storage system. However, many modifications and variations will be apparent to those of ordinary skill in the art. For example, any type of data storage unit may be used in implementing the present invention, such as, for example, CD-ROMS, DVDs and the like.

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In the following example, tape cartridges may be transferred from one automatic tape cartridge system to another automatic tape cartridge system. The automatic tape cartridge systems may have separate automated cartridge system library servers with no physical connection between them except, for example, a pass-through port. A user may create at least two tape cartridges in an unclassified library storage module silo. One of the tape cartridges remains in a first library storage module silo while a second tape cartridge is moved to an adjoining second classified library service module. This operation may be totally automatic. The unclassified library storage module places the second tape cartridge into a gateway pass-through port between the library storage modules. The second tape cartridge transferred to the classified library storage module receives the second tape cartridge through its gateway pass-through port. The second library storage module may then have the option of either mounting or shelving the tape cartridge.

Figure 4 depicts a block diagram illustrating data flow paths used to transfer data between a primary storage system and a secondary storage system is depicted in accordance with a preferred embodiment of the present invention. Primary storage system **400** sends data to secondary storage system **402** each time data is written to primary storage system by a data processing system, such

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as network **102** in **Figure 1**. Primary storage **400** and secondary storage **402** may be implemented using a storage system, such as, for example, storage system **106** in **Figure 1**.

Primary storage system **400** in this example includes a first set of volumes, volumes **404-408**. Secondary storage system **402** includes a second set of volumes, volumes **410-414**, which correspond to the first set of volumes in primary storage **400**. The correspondence between the volumes in these two storage systems is set up in pairs, such that a volume in primary storage system **400** has a corresponding volume in secondary storage system **402** to form the pair. For example, volume **404** is paired with volume **410**, volume **406** is paired with volume **412**, and volume **408** is paired with volume **414**.

Further, primary storage system **400** includes a primary data bridge **416** and a secondary status bridge **418**. Secondary storage system **402** includes a secondary data bridge volume **420** and a primary status bridge volume **422**. Volumes in each of the storage systems are designated for use in transferring data. As a result of this selection and configuration, primary data bridge volume **416**, secondary status bridge volume **418**, secondary data bridge volume **420**, and primary status bridge volume **422** are reserved for internal use by the two storage systems **400** and **402**.

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With the bridge volumes defined, two paths, data bridge path **424** and status bridge path **426** are established between primary storage system **400** and secondary storage system **402**. Data bridge path **424** begins at primary data bridge volume **416** in primary storage system **400** and ends at secondary data bridge volume **420** in secondary storage system **402**. Status bridge path **426** begins at primary status bridge volume **422** in secondary storage system **402** and ends at secondary status bridge volume **418** in primary storage system **400**. Data bridge path **424** is used to transfer data from primary data bridge volume **416** to secondary data bridge volume **420**, while status bridge path **426** is used to transfer status information from primary status bridge volume **422** to secondary status bridge volume **418**. Data written to volumes **404-408** are transferred to corresponding volumes **410-414**. In the depicted examples, the data is in the form of tracks that are copied from a primary volume to a secondary volume.

Data from different volumes in primary storage **400** are queued at primary data bridge volume **416** and transferred to secondary data bridge volume **420**. From secondary bridge volume **420**, the data is relocated to the corresponding volume of the pair in secondary storage **402**. This relocating step with virtual volumes involves converting and saving the data to the target volume. Converting means changing the track identifier from the

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bridge volume to the correct target volume. For example, data transferred from a volume, such as volume **404** to volume **410,** is transferred using primary data bridge volume **416** and secondary data bridge volume **420**. The data is transferred from volume **404** to primary data bridge volume **416**. This data is then transferred using data bridge path **424** to secondary data bridge volume **420**. When the data is received at secondary data bridge volume **420**, the data is then converted and saved to volume **410**. If data is to be transferred from volume **406** to volume **412**, the same data path, data bridge path **424** may be used.

Status information is sent from volume **420** and queued on primary status bridge volume **422**. After the status information is received on primary status bridge volume **422**, status information is returned using status bridge path **426**. No requirement is present for status information to be received confirming the writing of data to a secondary volume before data from a primary volume can be written to a corresponding secondary volume. In other words, the transfer of data and the return of status information may occur asynchronously.

In transferring tracks of data from a primary volume to a corresponding secondary volume, the target volume is identified such the data can be relocated to the correct volume once received at the secondary data bridge volume.

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Figure 5 is a block diagram of a mass storage system which operates with shared catalogues in accordance with a preferred embodiment of the present invention. Mass storage system represents the current framework in which cartridges are shared. Sharing cartridges in multiples library storage modules (LSMs) within an automatic cartridge system (ACS) has a shared control data set in an automated cartridge system library server (ACSLS) or a third party catalogue.

In this example, mass storage system **500** is an exemplary automated cartridge system (ACS). The ACS is designed to operate with an IBM or IBM-compatible host computer capable of communication with a conventional 327X-type terminal controller. Comprised generally of a library management unit (LMU) **510** and a library storage modules (LSM) **518** and **520**, mass storage system **500**, through its associated host software component (HSC), enables storage and retrieval of magnetic tape cartridges for use by a host computer across a conventional channel. LMU **510** serves as the library controller and provides the interface between from one to sixteen host computers and up to 16 LSMs.

Mass storage system **500** consists of LAN/WAN input signal **502** and LAN/WAN input signal **504** providing input into automated cartridge system library server **506**. Connected to ACSLS **506** is data control set (CDS) **508**. As input signals **502** and **504** are received by automated

cartridge system library server **506**, automated cartridge system library server **506** updates control data set **508**. When a cartridge is requested by a host, automated cartridge system library server **506** searches the catalogue which may be maintained on control data set **508**. Automated cartridge system library server **506** may determine the tape cartridge system location in the library row slot and then may instruct a robot (not shown) to fetch the tape cartridge and transport the tape cartridge to an assigned location, such as, for example a tape drive, a pass-through port and the like. ACSLS **506** separates input signals **502** and **504** into control information signal **522** and data signals **514** and **516**. Control information signal **522** is sent to library management unit **510**. Library process control information **522** and transmits the processed control information **522** via control path **512** to library service modules **518** and **520**. Library management unit **510** instructs the robot to move a tape cartridge from a first location to a second location. Library management unit **510** may be a TCP/IP protocol. Control information **522** is used to instruct the robot to transport a cartridge from a first location to a second location. In addition, the robot may be constantly updating control data set **508** as to the status of every robotic movement. This updating is done in the event of a power outage and therefore the robot would have up to date

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information as to the status of every tape cartridge in transit.

In addition, data signal **514** and data signal **516** are transmitted from ACSLS **506** to LSMs **518** and **520**. Data signals **514** and **516** may be transmitted over the same path but are independent of each other. There may be two signals. The first is control information signal **522** and data transfer signals **514** and **516**. Data signals **514** and **516** may only carry user data. Both control information **522** and data signals **514** and **516** may be transmitted over a WAN/LAN connection. However, ACSL server **506** separates LAN/WAN input signal **502** into control information signal **522** and data signals **514** and **516**.

Figure 6 is a block diagram of a mass storage system which operates with separate catalogues in accordance with a preferred embodiment of the present invention. In this example, LAN/WAN input signal **602** is input into ACSLS **606** while LAN/WAN input signal **604** is input into ACSLS **610**. In addition, both ACSLS **606** and ACSLS **610** have dedicated control data sets **608** and **612**, respectively. ACSLS **606** and **608** receive their input signals and provide separate and discrete control information signals and data signals. For example, ACSLS **606** receives LAN/WAN input signal **602**, splits LAN/WAN input signal **602** into control information signal **632**, which is transmitted to LMU **616**, and data signal **614**. LMU **616** processes control information signal **632** and outputs processed control information signal **632**

via control path **618**. Both processed control signal **632** and data **614** originating from LAN/WAN input signal **602** are input into LMU **620**. Likewise, ACSLS **610** receives LAN/WAN input signal **604**, splits LAN/WAN input signal **604** into control information signal **634**, which is transmitted to LMU **624**, and data signal **622**. LMU **624** processes control information signal **634** and outputs processed control information signal **634** via control path **626**. Both processed control signal **634** and data **622** originating from LAN/WAN input signal **604** are input into LMU **628**.

In this example, pass-through port **630** is designed to transport tape cartridges from library service module **620** to library service module **628** in either direction. Pass-through port **630** may be used when a tape cartridge is in a library service module, such as, for example, library service module **620** or **628** when all tape drives are in use. ACSL server **606** or **610** may look for the closest available tape drive and initiate a pass-through command to a targeted library service module and a tape drive.

A pass-through port may be manufactured in three sections (not shown) which may include a master receiver tower, a draw bar arm assembly and a slave receiver tower. The master receiver tower is called the master since it supplies power to the entire pass-through port assembly.

Tape cartridge movement may be as follows. The robot places a pass-through port cartridge in the master receiver tower. Once in the master receiver tower, the

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tape cartridge slides down a drop ramp onto a draw bar path located on the draw bar arm. The draw bar arm transports the tape cartridge along the draw bar path where it encounters a tumble block which rotates the tape cartridge, for example, 180 degrees, so that the tape cartridge is properly oriented for a receiving robot. At this point, the receiving robot is notified that a cartridge needs to be removed from a "GET" port. The GET port is located at the end of the draw bar path of the targeted tape cartridge. The GET port is where the robot fetches the tape cartridge from the pass-through port. For the present invention implementing a secure gateway, only the master receiver tower and the draw bar arm may be needed. Therefore, by eliminating the slave receiver tower it may be ensured that a tape cartridge is never sent back to the sending library service module.

Figure 7 is an exemplary flowchart illustrating a gateway pass through port (GPTP) in accordance with a preferred embodiment of the present invention. In this example, the operation starts by creating a tape cartridge (step **702**). Then a determination is made as to whether or not a copy of the tape is needed for a secure automatic cartridge system (step **704**). If a copy of the tape is not needed for a secure automatic cartridge system (step **704:NO**), there will be no gateway pass-through performed (step **706**) and thereafter the operation terminates. If a copy of the tape is needed for a secure automatic

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cartridge system (step **704:YES**), a copy of the tape is created (step **708**). An identification qualifier is added to the copy of the tape (step **710**). An identification qualifier may be, for example, a copy serial number range or a separate serial number range. Then a determination is made as to whether or not the software recognizes the tape copy (step **712**). The software may be invoked to handle the move request. If the software does not recognize the tape copy (step **712:NO**), the operation terminates. If the software does recognize the tape copy (step **712:YES**), the gateway pass-through is initiated (step **714**).

Then a request is made for a copy of the tape by the software (step **716**). The tape cartridge is then received from the robot (step **718**). The tape cartridge copy is then placed into the Master Receiver Tower (step **720**). The control data set is then updated (step **722**). The control data set may be part of the ACSL server disk or may be external to the ACSL server. The control data set is a catalogue of every movement of tape cartridges in the library service module. The control data set may be created and managed by the ACSL server. The tape cartridge is then moved from a GET port for the destination ACS (step **724**) and thereafter the operation terminates.

Figure 8 is an exemplary flowchart illustrating a source automatic cartridge system in accordance with a

preferred embodiment of the present invention. In this example, the operation begins with a determination as to whether or not the source ACS places the tape cartridge into the GET port (step **802**). If the source ACS does not place the tape cartridge into the GET port (step **802:NO**), the operation terminates. If the source ACS does place the tape cartridge into the GET port (step **802:YES**), the microcode directs the tape cartridge in the GET port (step **804**). The microcode may be resident in the library control unit. A microswitch in a drop ramp may simulate a cartridge access port door open and close (step **806**). A mounting plate may contain at least two microswitches that are mounted in the tape cartridge path such that when the tape cartridge reaches the GET port the microswitches toggle (step **808**). One microswitch is connected to a source LCU and the other microswitch is connected to a destination LCU. The tape cartridge is then decatalogued from the source ACS (step **810**). Once the cartridge is placed in the Master Tower Server (step **812**), the ACSL server is notified that the tape cartridge has been ejected (step **814**). The control data set is then updated to reflect that the tape cartridge has been ejected (step **816**) and thereafter the operation terminates.

Figure 9 is an exemplary flowchart illustrating a destination automatic cartridge system in accordance with a preferred embodiment of the present invention. In this example, a determination is made as to whether or not a

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sensor connected to the GET cell has notified the destination LCU that a tape cartridge needs to be inserted into the LSM (step **902**). The sensor may be a microswitch that is tripped when the tape cartridge is moved into the GET port. If the sensor connected to the GET cell has not notified the destination LCU that a tape cartridge needs to be inserted into the LSM (step **902:NO**), the operation terminates. If the sensor connected to the GET cell has notified the destination LCU that a tape cartridge needs to be inserted into the LSM (step **902:YES**), the tape cartridge is processed the same as if a tape cartridge was entered into a cartridge access port (step **904**). To transfer a tape cartridge into the library service module, an operator may enter a command to the ACSL server via a master terminal to unlock the cartridge access port (step **906**). When the tape cartridge is moved to the cartridge access port, a library control unit unlocks the cartridge access port (step **908**). When a door to the cartridge access port is closed, the library control unit senses the closing of the door to the cartridge access port (step **910**) and this initiates the robot to retrieve the tape cartridge (step **912**).

Then an operator is prompted to insert a tape cartridge (step **914**). The ACSL server may prompt an operator to either mount the tape cartridge in a tape drive or catalogue the tape cartridge into the library service module for future reference. The insertion point

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is the GET port for the secure gateway. Then a determination is made as to whether or not the tape cartridge is inserted (step **916**). If the tape cartridge is not inserted (step **916:NO**), the operation terminates.

If the tape cartridge is inserted (step **916:YES**), the robot is instructed to retrieve the tape cartridge (step **918**). Then a determination is made as to whether or not the tape cartridge is retrieved from the GET port (step **920**). If the tape cartridge is not retrieved from the GET port (step **920:NO**), the operation terminates. If the tape cartridge is retrieved from the GET port (step **920:YES**), the tape cartridge is catalogued into the destination ACS control data set (step **922**) and thereafter the operation terminates.

Therefore, the present invention provides an improved method and apparatus for an addressing security issues of transmission of data between an unclassified and classified network. The present invention also provides an improved method and apparatus for allowing the expansion beyond sixteen library storage modules without major revisions to the host software component (HSC).

The description of the present invention has been presented for purposes of illustration and description, but is not intended to be exhaustive or limited to the invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in

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the art. For example, transferring tape cartridges from one automated tape cartridge system to another automated tape cartridge system was described. However, any type of data storage unit may be used in implementing the present invention, such as, for example, CD-ROMS, DVDs and the like. The embodiment was chosen and described in order to best explain the principles of the invention, the practical application, and to enable others of ordinary skill in the art to understand the invention for various embodiments with various modifications as are suited to the particular use contemplated.